

ESTUARINE MACRO-ALGAE OF YAQUINA BAY, NEWPORT, OREGON

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Previous taxonomic and ecological investigations of the macro-algae of the Pacific Coast have been primarily descriptive of the algae of the open coast. The estuarine algae have been omitted or treated only incidentally. As a result, our knowledge of the algal species of the open coast is much more complete than our understanding of the algal flora of estuaries. The coastal marine algal flora of Oregon has been investigated by a number of phycologists and was summarized by Sanborn and Doty (1944) and Doty (1947a and 1947b). The present study was undertaken in conjunction with a study of the salinity and temperature tolerances of some macro-algae of Yaquina Bay (Kjeldsen and Phinney, in press.)

Yaquina Bay is located on the central Oregon Coast and drains approximately 389 square km of the central Coast Range. Free tidal access is provided by the maintenance of twin jetties at the mouth of the estuary resulting in a strong marine influence extending approximately 15 km into the estuary. The widest point (3.2 km) of the estuary is near the mouth; above this point the estuary gradually narrows into the Yaquina River.

The collecting stations established in the bay correspond to the reference navigational markers (fig. 1). The stations were sampled monthly over a two year period, from January 1964 to January 1966. Specimens were sampled either by SCUBA diving or during low tides. The specimens were returned to the laboratory for identification and many of these were mounted for a permanent record. Duplicates have been deposited in the herbarium of the Oregon State Marine Science Center and in the collections of the authors.

SPECIES PRESENT AND THEIR HABITATS

The zones of vertical distribution of algae listed are in accordance with those given in most phycological literature. The intertidal zone lies between high water and low water of the extreme spring tides. The sublittoral zone extends downward from the low water of the extreme low tides. Algae in the upper and mid-intertidal zones are usually exposed during low tides; those in the lower intertidal are only exposed occasionally; and those in the subtidal are never exposed. Depths in

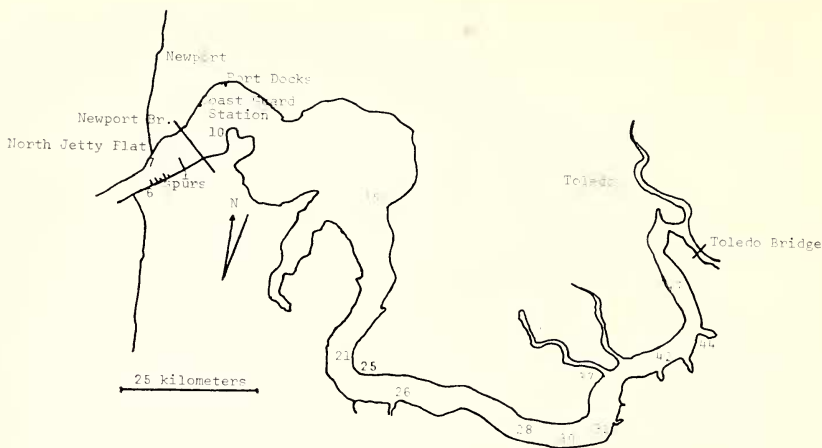


FIG. 1. Map of the survey area showing collecting stations. Numbers 1-6 are "spurs" or groins on the south jetty. Numbers 7-47 refer to reference navigational markers.

meters are determined from the mean low tide. The species present in Yaquina Bay, their habitat, tidal zone, temperature, and salinity ranges, are presented in Table I.

TEMPERATURE AND SALINITY TOLERANCE

Data concerning the temperature and salinity regimes in the estuary (Kjeldsen and Phinney, in press) have been used together with collection data for the algal inhabitants to determine their distribution with relation to temperature and salinity. The results showed that the majority of the species are found in 33 to 30‰ salinity and of these 75 were red algae, 28 brown algae, and 23 green algae. Analysis of the temperature data showed that the majority of the species were found in 10-12°C; of these 73 were red algae, 29 brown algae, and 24 green algae. Only six species were found in salinities ranging from 33 to 5‰, and only 15 species were found in temperatures ranging from 20 to 10°C; all other species had narrower tolerance ranges.

DISTRIBUTION OF SPECIES AND SEASONAL OCCURRENCE

Approximately 90 per cent of the species of algae of Yaquina Bay and estuary are found in the area from the end of the jetties at the mouth of the estuary to the Yaquina Bay bridge. Most algae in this area are characteristic of the open coast and may be considered "invaders". A few taxa, such as *Ulva expansa*, *Laminaria saccharina*, *Sargassum muticum*, and *Gracilaria sjoestedtii*, are found only in areas such as this. From the Yaquina Bay bridge to Marker 21, there is a transition zone containing both marine and brackish water algae.

The distribution of some species may be limited by the lack of suitable substrate. Most benthic plants require a firm surface for attachment, and the substrate must be free of silt for sporelings to develop. In the estuary available substrates include large boulders on a shifting, sandy bottom at the north and south jetties, a sandstone reef with tidepools between the north jetty and Yaquina Bay bridge, rock rubble of the fills along the estuary, and mud with some cobble and other debris from Marker 15 to Elk City. Shells, pilings, logs, and dock floats also provide common substrates. The log floats of docks along the estuary constitute a unique habitat, as the organisms colonizing them in the spring are never exposed by the tides, but always remain near the surface where the light intensity is high and the problem of siltation is relatively minor. The general effect is of a sub-tidal habitat. Algae are absent, with a few exceptions, in the lower intertidal zone along the main channel from Marker 15 to the Toledo bridge, probably because of lack of suitable substrate, constant exposure to currents, and the presence of moving silt. A rather lush vegetation of *Fucus*, *Enteromorpha*, *Chaetomorpha*, *Gracilaria*, and *Ulvaria* occurs, however, in protected locations in side channels and sloughs in this area.

Perennating vegetative structures were observed in a number of forms during the winter. The encrusting basal disks of *Heterochordaria*, *Petalonia*, and *Corallina*, were common on the jetty during December, January, and February and resumed growth in the spring. Species of *Iridaea* and *Gigartina* persisted over the winter as basal holdfasts and resumed growth in the spring. *Laminaria saccharina* on the floats of the port docks died back to the stipe and resumed growth in the spring in competition with young germlings. *Laminaria setchellii* and *L. sinclairii* showed similar responses. The holdfast and basal portions of the stipe of *Egregia* persisted through the winter, often in a battered and highly epiphytized state, resuming growth in the spring. *Sargassum* died back to its holdfast and a few basal branches and resumed growth in the spring. The greatest changes occurred in the upper and middle intertidal zone. Most of the algae were eaten or decayed back to their holdfasts during winter. Many other species, particularly some of the red algae in the lower intertidal and subtidal, were not markedly affected by winter conditions and continued growth and reproduction throughout the year.

In Yaquina Bay and estuary three seasonal vegetations can be distinguished: 1) spring; 2) summer; and 3) fall and winter. The largest number of species and the greatest production of biomass occur during the spring and summer. From November to February the biomass is greatly diminished by peak occurrence of epiphytes and animal grazers, winter storms, silt, low salinities, and short photoperiod. There is however, a distinctive winter flora. Judging from direct visual observation there appear to be two periods of decline and decay, one of the spring vegetation in the early summer, and another of the summer vegetation

in the fall. Evidence of this is seen in the windrows of debris that accumulate on the shores.

A very diverse algal vegetation exists in Yaquina Bay, yet some of the species common on the rocky outer coast of Oregon that are conspicuously lacking in Yaquina Bay include the following: *Codium setchellii* Gardner, *Codium fragile* (Suring) Hariot, *Ralfsia* spp., *Coilodesme californica* (Ruprecht) Kjellman, *Desmarestia* spp. with one exception, *Pleurophycus gardneri* Setchell & Saunders, *Costaria costata* (Turner) Saunders, *Macrocystis integrifolia* Bory, *Lessoniopsis littoralis* (Farlow & Setchell) Reinke, *Postelsia palmaeformis* Ruprecht, *Pterygophora californica* Ruprecht, *Cystoseira osmundacea* (Menzies) C. Agardh, the coralline algae with three exceptions, *Plocamium violaceum* Farlow, *Farlowia mollis* (Harvey & Bailey) Farlow & Setchell, *Ahnfeltia plicata* (Hudson) Fries, and *Stenogramme californica* Harvey. *Macrocystis integrifolia* Bory was found on several occasions in large floating mats. These had entered the bay from offshore.

Among the algae collected in the Yaquina estuary the following are new records for Oregon: *Chaetomorpha aerea*, *Phaeostrophion irregulare*, *Haplospogonidion gelatinosum*, *Halymenia californica*, *Gracilaria verrucosa*, *Porphyra smithii*, and *Neodilsea americana*.

The authors are indebted to Dr. Isabella Abbott for her identification of *Neodilsea* and verification of *Halymenia* and *Schizymenia*.

TABLE 1. SPATIAL DISTRIBUTION, SEASONAL OCCURRENCE, SALINITY AND TEMPERATURE RANGES OF MACRO-ALGAE IN YAQUINA BAY. Collection locations and reference navigational markers are shown in Figure 1. Salinity data are expressed in parts per thousand (‰) and temperature in degrees centigrade.

Chlorophyta

- Blidingia marginata* (J. Agardh) Dangard. Growing on *Salicornia* (pickle grass) of mud flats or in tide pools in the upper intertidal; Summer; markers 15 to 37; 33–15 ‰; 20–13° C.
- Bryopsis corticulans* Setchell in Collins, Holden & Setchell. On rocks or logs in the lower intertidal to a depth of 3 m in subtidal; Spring, Summer, and Fall; 6th Spur to marker 21; 33–25 ‰; 20–10° C.
- Cladophora gracilis* (Griffiths) Kützing. On mud flats, rocks, or logs in the middle intertidal; Spring; 1st Spur to marker 25; 33–20 ‰; 16–10° C.
- Cladophora trichotoma* (C. Agardh) Kützing. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to 3rd Spur; 33–30 ‰; 16–10° C.
- Enteromorpha clathrata* (Roth) Greville. On rocks, logs, epiphytic, or free floating in the middle to lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to Toledo Bridge >33–5 ‰; >20–13° C.
- Enteromorpha compressa* (L.) Greville. On rocks and logs in the upper intertidal; Summer, Fall and Winter; 1st Spur to marker 47; 33–20 ‰; 20–10° C.
- Enteromorpha intestinalis* (L.) f. *clavata* J. Agardh. On rocks, shells, logs, or epiphytic on *Fucus* in the upper intertidal. In January, February, and March, a distinct and obvious green zone of this species appears on the rocks of the estuary in what would correspond to an extreme high intertidal or splash zone; Spring, Summer, Fall and Winter; 3rd Spur to Toledo Bridge; >33–>5 ‰; >20–>10° C.

- Enteromorpha intestinalis* (L.) Link f. *cylindrica* J. Agardh. This may simply be a growth form of f. *clavata*. Free floating; Spring and Summer; 3rd Spur to marker; 30–5 ‰; 20–10° C.
- Enteromorpha linza* (L.) J. Agardh. On rocks, shells, or logs in the lower intertidal to mid-intertidal; Spring, Summer, Fall and Winter; 6th Spur to marker 37; >33–25 ‰; 20–10° C.
- Enteromorpha tubulosa* Kützting. On logs or rocks in the upper intertidal; Summer and Fall; 3rd Spur to Toledo Bridge; 30–10 ‰; 20–<10° C.
- Enteromorpha angusta* (Setchell & Gardner) Doty. On rocks, logs or epiphytic in the lower intertidal to a depth of 3 m; Spring, Summer, Fall and Winter; 6th Spur to marker 37; >33–30 ‰; 16–<10° C.
- Kornmannia zostericola* (Tilden) Bliding. Epiphytic on *Zostera* in the lower intertidal; Summer and Fall; North Jetty flat to marker 15; 33–30 ‰; 12–10° C.
- Rhizoclonium riparium* (Roth) Harvey. On rocks, mud, logs, or entangled on other algae in the lower intertidal; Spring, Fall and Winter; markers 12 to 47; 33–10 ‰; 16–10° C.
- Spongomorpha coalita* (Ruprecht) Collins. On rocks, logs, or epiphytic in the lower intertidal; Spring, Summer and Fall; 6th Spur to Port Docks; 33–25 ‰; 12–10° C.
- Spongomorpha spinescens* Kützting. Epiphytic in the lower intertidal; Spring, 6th Spur to North Jetty flat; 32–28 ‰; 12–10° C.
- Ulothrix implexa* Kützting. On rocks in the upper intertidal zone; Spring; 6th Spur only; 33–30 ‰; 12–10° C.
- Ulva expansa* (Setchell) Setchell & Gardner. On rocks or logs in the lower intertidal to a depth of 5 m; Spring, Summer, Fall and Winter; 6th Spur to marker 37; >–25 ‰; 16–<10° C.
- Ulva fenestrata* Postels & Ruprecht. On rocks or logs in the lower intertidal to a depth of 4 m; Summer, Fall and Winter; 6th Spur to Port Docks; 33–25 ‰; 12–10° C.
- Ulva lobata* (Kützting) Setchell & Gardner. On rocks or epiphytic in the lower intertidal; Spring, Summer, and Fall; 6th Spur to Newport Bridge; 33–25 ‰; 12–<10° C.
- Ulva rigida* C. Agardh. On rocks and wood or epiphytic in the intertidal and subtidal; Summer, Fall and Winter; 6th Spur to Port Docks; >33–25 ‰; 12–<10° C.
- Ulva taeniata* (Setchell) Setchell & Gardner. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; >33–25 ‰; 16–>10° C.
- Ulvaria fuscum* (Postels & Ruprecht) Bliding. On rocks in the mid-intertidal; Fall; 1st Spur to Newport Bridge; 33–30 ‰; 12–10° C.
- Ulvaria oxyspermum* (Kützting) Bliding. On rocks, logs, sticks, or entangled with other algae or salt grass in the upper and mid-intertidal; Spring, Summer, Fall and Winter; 1st Spur to Toledo Bridge; >33–<5 ‰; >20–<10° C.
- Urospora penicilliformis* (Roth) Areschoug. On rocks in the upper intertidal; Summer; 6th Spur only; 33–30 ‰; 16–10° C.

Phaeophyta

- Alaria marginata* Postels & Ruprecht. On rocks, or logs lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Port Docks; >33–25 ‰; 16–<10° C.
- Desmarestia munda* Setchell & Gardner. On rocks and logs in the lower intertidal to a depth of 4 m; Spring, Summer, and Fall; 6th Spur to marker 21; 33–25 ‰; 20–<10° C.
- Ectocarpus acutus* Setchell & Gardner var. *acutus*. Epiphytic on *Desmarestia* and *Alaria* in the lower intertidal; Spring; 6th Spur to Coast Guard Dock; 33–30 ‰; 12–<10° C.

- Ectocarpus confervoides* (Roth) LeJolis f. *confervoides*. Epiphytic on larger brown algae in the lower intertidal; Spring; 3rd Spur to Coast Guard Dock; 33-30‰; 12- $<10^{\circ}$ C.
- Ectocarpus parvus* (Saunders) Hollenberg. Epiphytic on *Desmarestia* or *Laminaria saccharina* in the lower intertidal to subtidal; Fall and Winter; 1st Spur to Port Docks; 33-25‰; 12- $<10^{\circ}$ C.
- Egregia menziesii* (Turner) Areschoug subsp. *menziesii*. On rocks in the lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Coast Guard Dock; 33-25‰; 16- $<10^{\circ}$ C.
- Elachistea fucicola* (Vellay) Areschoug. Epiphytic on *Fucus* in the upper intertidal; Spring, Summer, Fall, and Winter; 6th Spur to marker 37; $>33-5\%$; $>20- $<10^{\circ}$ C.$
- Fucus evanescens* Gardner f. *oregonensis*. On rocks or mud flats in the middle intertidal. On the mud flats in some locations this species exists as sterile mats; Spring, Summer, Fall and Winter; markers 27 to 47; $>35- $<5\%$; $>20- $<10^{\circ}$ C.$$
- Fucus distichus* L. subsp. *edentatus* (De la Pylaie) Powell. On rocks or logs in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to marker 27; 33-25‰; 16- $<10^{\circ}$ C.
- Giffordia granulosa* (J. E. Smith) Hamel. On rocks in the lower intertidal; Spring and Winter; 1st Spur to Newport Bridge; 33-25‰; 14- $<10^{\circ}$ C.
- Giffordia granulosoidea* (Setchell & Gardner) Hollenberg & Abbott. On log floats; Winter; Coast Guard Dock to marker 21; 29-25‰; 11- $<10^{\circ}$ C.
- Giffordia mucronata*** (Saunders) Kjeldsen & Phinney, comb. nov. (*Ectocarpus mucronatus* Saunders). On logs and epiphytic on *L. sinclairii* in the lower intertidal and subtidal; Spring; 6th Spur to Coast Guard Dock; 33-29‰; 16- $<10^{\circ}$ C.
- Giffordia oviger* (Harvey) Hollenberg & Abbott. On rocks in the upper intertidal; Winter; 1st Spur to Newport Bridge; 32-25‰; 12- $<10^{\circ}$ C.
- Haplospogonidium gelatinosum* Saunders. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33-25‰; 17- $<10^{\circ}$ C.
- Haplogloia andersonii* (Farlow) Levring. On rocks in the middle intertidal; Spring; 1st Spur to Newport Bridge; 33-25‰; 20- $<10^{\circ}$ C.
- Hecatonema variable* Setchell & Gardner. On pneumatocysts and stipes of *Nereocystis*, and lamina of *Hedophyllum*, and *Laminaria*; Winter; 1st Spur to Newport Bridge; 30-25‰; 12- $<10^{\circ}$ C.
- Hedophyllum sessile* (C. Agardh) Setchell, in Collins, Helden, & Setchell. On rocks in the middle intertidal; Spring, Summer, Fall and Winter; 6th Spur to marker 12; 35-27‰; 16- $>10^{\circ}$ C.
- Heterochordaria abietina* (Ruprecht) Setchell & Gardner. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to North Jetty flat; 32-25‰; 12- $<10^{\circ}$ C.
- Laminaria saccharina* Lamouroux f. *saccharina*. On rocks or log floats in the lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 3rd Spur to marker 21; 33-25‰; 16- $<10^{\circ}$ C.
- Laminaria setchellii* Silva. On rocks in the lower intertidal or subtidal to a depth of 1 m; Spring, Summer, Fall and Winter; 6th Spur to North Jetty flat; 33-30‰; 14- $<10^{\circ}$ C.
- Laminaria sinclairii* (Harvey ex Hooker f. & Harvey) Farlow, Anderson, & Eaton. On rocks in the lower intertidal to a depth of 1 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to North Jetty flat: 33-28‰; 15- $<10^{\circ}$ C.
- Leathesia difformis* (L.) Areschoug. On rocks or epiphytic in the upper intertidal; Spring and Summer; 3rd Spur to North Jetty flat; 33-30‰; 16- $<10^{\circ}$ C.
- Nereocystis luetkeana* (Mertens) Postels & Ruprecht. On rocks in the subtidal to a depth of 5 m. Dense stands develop each spring and persist until November on the spurs of the south jetty; Spring, Summer, Fall and Winter; 6th Spur to marker 12; 33-30‰; 16- $<10^{\circ}$ C.

- Pelvetiopsis limitata* Scagel f. *limitata*. On rocks high in the upper intertidal; Summer and Fall; 3rd Spur to Newport Bridge; 33–29‰; 13–<10° C.
- Petalonia debilis* (C. Agardh) Derbes & Solier f. *debilis*. On rocks, logs or *Zostera* in the upper to the lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to marker 12; 33–25‰; 16–<10° C.
- Phaeostrophion irregulare* Setchell & Gardner. On rocks or logs in the middle intertidal; Spring, Summer, Fall and Winter; 3rd Spur to Newport Bridge; 33–25‰; 16–<10° C.
- Pilayella littoralis* (Lyngbye) Kjellman. On log floats; Spring; Coast Guard Dock to Port Docks; 32–30‰; 11–<10° C.
- Sargassum muticum* (Yendo) Fensholt. On rocks subtidal to a depth of 4 m. The most luxuriant growth occurs on the leeward side of the spurs on the south jetty; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–30‰; 16–<10° C.
- Scytosiphon lomentaria* (Lyngbye) J. Agardh f. *lomentaria*. On rocks or logs in the lower intertidal; Summer and Fall; 3rd Spur to marker 21; 33–29‰; 16–<10° C.
- Soranthera ulvoidea* Postels & Ruprecht. Epiphytic on *Rhodomela* in the upper intertidal; Summer; 6th Spur to North Jetty flat; 33–30‰; 12–<10° C.
- Streblonema acidiodides* Setchell & Gardner var. *pacificum* Setchell & Gardner. Epiphytic on *Hedophyllum*, *Laminaria* and *Alaria*; Fall and Winter; 6th Spur to Newport Bridge; 33–25‰; 12–<10° C.

Rhodophyta

- Ahnfeltia gigartinoidea* J. Agardh. On rocks in the lower intertidal; Spring; 6th Spur to 3rd Spur; 33–30‰; 12–10° C.
- Antithamnion kylinii* Gardner. On log floats; Summer; Coast Guard Dock to Port Docks; 33–30‰; 12–10° C.
- Antithamnion pacificum* (Harvey) Kylin. On log floats; Spring and Summer; 1st Spur to Port Docks; 33–29‰; 12–10° C.
- Bangia fuscopurpurea* Harvey. On piling or rocks in the upper intertidal; Spring, Summer, Fall and Winter; 1st Spur to Port Docks; 33–27‰; 16–<10° C.
- Bossiella dichotoma* (Manza) Silva. On rocks in the lower intertidal to a depth of 2 m; Spring, Summer, Fall and Winter; 6th Spur to 1st Spur; 33–26‰; 12–10° C.
- Botryoglossum ruprechtiana* (J. Agardh) De Toni. On rocks; subtidal; Summer; 6th Spur only; 33–29‰; 12–10° C.
- Callithamnion pikeanum* Harvey. On rocks or epiphytic in the lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to 1st Spur; 33–30‰; 12–10° C.
- Callophyllis violacea* J. Agardh. Subtidal on rocks to a depth of 5 m; Spring, Summer, Fall and Winter. 6th Spur to 1st Spur; 33–28‰; 16–<10° C.
- Ceramium californicum* J. Agardh. Found only on *Gracilariopsis* as an epiphyte in the lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–30‰; 16–<10° C.
- Ceramium gardneri* Kylin. On rocks in the lower intertidal; Spring; 6th Spur to 3rd Spur; 32–28‰; 12–<10° C.
- Ceramium eatonianum* (Farlow) De Toni. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Winter; 6th Spur to North Jetty flat; 33–25‰; 16–10° C.
- Ceramium pacificum* (Collins) Kylin. On rocks in the lower intertidal; Summer, 6th Spur to North Jetty flat; 32–30‰; 12–<10° C.
- Constaninea simplex* Setchell. Collected on several occasions only during the spring of 1964. On rocks in the lower intertidal; Spring, Summer, Fall and Winter; 3rd Spur to 1st Spur; 33–30‰; 12–10° C.
- Corallina officinalis* L. var. *chilensis* (Harvey) Kützinger. On rocks in the middle intertidal to a depth of 3 m; Summer; 6th Spur to 1st Spur; 33–30‰; 12–10° C.

- Corallina vancouveriensis* Yendo. On rocks, the encrusting basal portion present all year in the upper intertidal to a depth of 3 m in the subtidal; Summer, Fall and Winter; 6th Spur to 1st Spur; 33–30 ‰; 12–<10° C.
- Cryptopleura violacea* (J. Agardh) Kylin. Epiphytic on red algae in the lower intertidal to a depth of 2 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–30 ‰; 12–10° C.
- Cryptosiphonia woodii* J. Agardh. On rocks in the upper to lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to Coast Guard Dock; 33–27 ‰; 16–<10° C.
- Cumagloia andersonii* (Farlow) Setchell & Gardner in Gardner. On rocks in the upper intertidal; Spring and Summer; 6th Spur to 1st Spur; 33–30 ‰ 15–10° C.
- Delesseria decipiens* J. Agardh. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Spring; 6th Spur to Newport Bridge; 33–30 ‰; 16–10° C.
- Endocladia muricata* (Postels & Ruprecht) J. Agardh. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to 1st Spur; 33–28 ‰; 16–<10° C.
- Erythrophyllum delesserioides* J. Agardh. On rocks in the subtidal to a depth of 3 m; Summer; 6th Spur only; 33–29 ‰; 15–<10° C.
- Gelidium coulteri* Harvey. On rocks in the middle intertidal; Fall and Winter; 6th Spur to 3rd Spur; 33–28 ‰; 16–<10° C.
- Gigartina agardhii* Setchell & Gardner. On rocks in the upper intertidal; Spring, Fall and Winter; 6th Spur to Newport Bridge; 33–29 ‰; 16–<10° C.
- Gigartina californica* J. Agardh. On rocks in the lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–25 ‰; 16–10° C.
- Gigartina cristata* (Setchell) Setchell & Gardner. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–25 ‰; 16–<10° C.
- Gigartina harveyana* (Kützinger) Setchell & Gardner. On rocks in the lower intertidal and subtidal; Fall and Winter; 6th Spur to Newport Bridge; 32–26 ‰; 12–10° C.
- Gigartina papillata* (C. Agardh) J. Agardh. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–25 ‰; 15–<10° C.
- Gigartina spinosa* (Kützinger) Harvey. On rocks in the lower intertidal to a depth of 1 m in the subtidal; Summer, Fall and Winter; 6th Spur to 1st Spur; 33–26 ‰; 14–<10° C.
- Gigartina volans* (C. Agardh) J. Agardh. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Spring, Summer and Fall; 6th Spur to 1st Spur; 33–30 ‰; 15–10° C.
- Gracilaria sjoestedtii* (Kylin) Papenfuss. On rocks and shells in the lower intertidal to a depth of 4 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–26 ‰; 16–<10° C.
- Gracilaria verrucosa* (Hudson) Papenfuss. Massive patches in protected mud flats in the mid-intertidal; Spring and Winter; markers 27 to 37; 33–20 ‰; 20–<10° C.
- Grateloupia doryphora* (Montagne) Howe. On rocks in the lower intertidal; Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–30 ‰; 12–10° C.
- Gymnogongrus leptophyllus* J. Agardh. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–25 ‰; 16–<10° C.
- Gymnogongrus linearis* (Turner) J. Agardh. On rocks in the lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to North Jetty flat; 33–25 ‰; 16–<10° C.

- Halymenia californica* Smith & Hollenberg. On rocks in the lower intertidal; Spring, Summer and Fall; 6th Spur to Newport Bridge; 33–30‰; 15–<10° C.
- Hymenea flabelligera* (J. Agardh) Kylin. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Winter; 6th Spur only; 32–28‰; 12–11° C.
- Hymenea multiloba* (J. Agardh) Kylin. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Fall and Winter; 6th Spur only; 33–28‰; 12–10° C.
- Iridaea cordata* (Turner) Abbott var. *cordata*. On rocks lower intertidal to a depth of 2 m in the subtidal; Summer, Fall and Winter; from 6th Spur to Newport Bridge; 33–28‰; 15–<10° C.
- Iridaea flaccida* (Setchell & Gardner) Hollenberg & Abbott. On rocks lower intertidal to a depth of 2 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–30‰; 15–<10° C.
- Iridaea heterocarpa* Postels & Ruprecht. On rocks upper to middle intertidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–25‰; 16–<10° C.
- Laurencia spectabilis* Postels & Ruprecht. On rocks in the lower intertidal to a depth of 2 m; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–28‰; 16–<10° C.
- Membranoptera multiramosa* Gardner. On rocks in the lower intertidal or subtidal; Spring and Summer; 6th Spur to Port Docks; 33–28‰; 16–10° C.
- Microcladia borealis* Ruprecht. On rocks and epiphytic in the lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to 1st Spur; 32–26‰; 16–<10° C.
- Neodilsea americana* Abbott. On rocks in the lower intertidal and subtidal; Summer; 6th Spur to 1st Spur; 33–29‰; 14–<10° C.
- Odonthalia floccosa* (Esper) Falkenberg. On rocks in the lower intertidal to a depth of 3 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Coast Guard Dock; 33–26‰; 16–<10° C.
- Odonthalia washingtoniensis* Kylin. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–27‰; 16–<10° C.
- Opuntia californica* (Farlow) Kylin. On rocks in the lower intertidal; Spring; 6th Spur to 3rd Spur; 33–30‰; 12–10° C.
- Pikea pinnata* Setchell. On rocks in the lower intertidal; Spring and Summer; 6th Spur to 1st Spur; 33–30‰; 16–<10° C.
- Platythamnion pectinatum* Kylin. On rocks or logs in the lower intertidal to a depth of 5 m in the subtidal. In the early spring, it is in the intertidal but is found only subtidally during the summer and fall; Spring, Summer, Fall and Winter; 6th Spur to marker 21; 33–30‰; 12–10° C.
- Platythamnion villosum* Kylin. On rocks in the lower intertidal and subtidally; Spring; 6th Spur to 3rd Spur; 33–29‰; 12–<10° C.
- Plocamium pacificum* Kylin. On rocks in the lower intertidal to a depth of 2 m in the subtidal; Fall and Winter; 6th Spur to 3rd Spur; 32–27‰; 11–<10° C.
- Polyneura latissima* (Harvey) Kylin. On rocks, logs or epiphytic in the lower intertidal to a depth of 3 m. Common in the spring and summer of 1964, rare in spring and summer of 1965, but common in the spring of 1966; Spring, Summer and Fall; 6th Spur to Port Docks; 33–29‰; 14–<10° C.
- Porphyra lanceolata* (Setchell & Hudson) Smith & Hollenberg. On rocks in the upper intertidal; Fall, Winter and Spring; 3rd Spur to Newport Bridge; 33–25‰; 13–<10° C.
- Porphyra nereocystis* Anderson, in Blankinship & Keeler. Rare, found only on *Nereocystis* in wash; Spring; North of Jetty flat to Newport Bridge; 33–28‰; 16–10° C.
- Porphyra perforata* J. Agardh f. *perforata*. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 3rd Spur to marker 12; 33–25‰; 16–<10° C.
- Porphyra smithii* Hollenberg & Abbott. Epiphytic in middle intertidal; Spring, Summer and Fall; 6th Spur to North Jetty flat; 33–28‰; 12–<10° C.

- Porphyra thruetii* (Setchell & Hudson) Smith & Hollenberg. On rocks in the upper intertidal; Summer; 3rd Spur to North Jetty flat; 33–30‰; 12–10° C.
- Porphyrella gardneri* Smith & Hollenberg. On *Phyllospadix* or *Laminaria sinclairii* in the lower intertidal to subtidal; Summer and Fall; 6th Spur to 1st Spur; 33–30‰; 15–10° C.
- Polysiphonia collinsii* Hollenberg. On rocks in the lower intertidal; Spring; 6th Spur to North Jetty flat; 33–28‰; 11–10° C.
- Polysiphonia decussata* Hollenberg. Epiphytic on *Enteromorpha* in the middle intertidal; Summer; markers 37 to 47; 15–10‰; 20–17° C.
- Polysiphonia pacifica* Hollenberg. On rocks or logs in the lower intertidal to the subtidal; Spring, Summer, Fall and Winter; 3rd Spur to marker 37; 33–10‰; >20–<10° C.
- Polysiphonia paniculata* Montagne. On rocks or logs in the lower intertidal to a depth of 3 m; Spring, Summer, Fall and Winter; 6th Spur to marker 47; >33–<5‰; >20–<10° C.
- Prionitis andersonii* Eaton. On rocks in the lower intertidal; Spring, Summer, Fall and Winter; 3rd Spur to Newport Bridge; 33–28‰; 16–<10° C.
- Prionitis lanceolata* Harvey. On rocks in the upper intertidal; Spring and Winter; 6th Spur to North Jetty flat; 33–26‰; 11–<10° C.
- Prionitis lyallii* Harvey. On rocks in the middle intertidal; Spring and Winter; 6th Spur to North Jetty flat; 33–30‰; 11–<10° C.
- Pterosiphonia bipinnata* (Postels & Ruprecht) Falkenberg. On rocks in the lower intertidal to subtidal; Spring and Summer; 6th Spur to Newport Bridge; 33–28‰; 14–<10° C.
- Pterosiphonia dendroidea* (Montagne) Falkenberg. Epiphytic and on rocks in the lower intertidal to subtidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–28‰; 16–<10° C.
- Ptilota filicina* (Farlow) J. Agardh. On rocks in the lower intertidal; Spring, Summer, Fall and Winter; 6th Spur to 1st Spur; 32–26‰; 14–10° C.
- Rhodomela larix* (Turner) C. Agardh. On rocks in the upper intertidal; Spring, Summer, Fall and Winter; 6th Spur to Newport Bridge; 33–26‰; 16–<10° C.
- Rhodymenia pacifica* Kylin. On rocks in the subtidal to a depth of 3 m; Summer and Fall; 6th Spur to 1st Spur; 33–25‰; 15–<10° C.
- Schizymenia pacifica* Kylin. On rocks in the lower intertidal; Summer, Fall and Winter; 6th Spur to 3rd Spur; 33–26‰; 15–<10° C.
- Smithora naiadum* (Anderson) Hollenberg. Epiphytic on *Zostera* and *Phyllospadix* in the lower intertidal; Summer and Fall; 6th Spur to 1st Spur; 33–28‰; 16–10° C.

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